

CLAIMS

1. A method for producing an SiGe-based semiconductor thin film to be served as a member of a thermoelectric transducing material component that is a constituent element of a sensor device whose signal source is a temperature differential and that transduces a local temperature differential produced by a selective catalyst reaction into an electric signal, comprising the steps of:

- (1) forming an SiGe-based semiconductor thin film over a substrate by sputtering vaporization; and
- (2) heat treating the SiGe-based semiconductor thin film material after the sputtering vaporization.

2. The method according to Claim 1, wherein the heat treatment is performed at a temperature of from 600°C to 1000°C.

3. The method according to Claim 1, wherein the substrate temperature and/or the plasma output is raised in the formation of a SiGe-based semiconductor thin film by sputtering vaporization method, to form a thin film with a more highly crystallized structure.

4. The method according to Claim 1, wherein the heat treatment is performed by furnace annealing with a controlled atmosphere using an ordinary electric furnace, or by rapid thermal process using an infrared lamp heating apparatus capable of atmosphere control.

5. The method according to Claim 1, wherein, during sputtering, a thin film is produced by first doping an SiGe target with an impurity, and during heat treatment, the gas atmosphere, temperature, heat treatment duration, and temperature elevation time are controlled, so that crystallization is performed while the amount of impurity in the semiconductor thin film is controlled.

6. The method according to Claim 1, wherein, during heat treatment, the heat treatment conditions are controlled, an insulator thin film of an oxide is grown over the semiconductor thin film, and crystallization is performed while an insulation layer is produced.

7. The method according to Claim 1, wherein, during the sputtering vaporization of the SiGe-based thin film, the temperature of the heat treatment can be lowered by vapor depositing a transition metal typified by nickel.

8. The method according to Claim 1, wherein a sensor device whose signal source transduces a local temperature differential produced by a selective catalyst reaction into an electric signal is exposed to a volatile organosilicon gas to form a thin film on the surface thereof, thereby increasing the gas selectivity thereof.

9. An SiGe-based thin film produced by the method according to any of Claims 1 to 8, which serves as a member of a thermoelectric transducing material component that is a constituent element of a sensor device whose signal source is a temperature differential and that transduces a local temperature differential into an electric signal, and which has been endowed with good thermoelectric characteristics by heat treatment.

10. A gas sensor device containing as a constituent element the SiGe-based thin film according to Claim 9.